

# International Geophysical Calendar 2015 (FINAL)

(See information to follow on the use of this Calendar)

	S	M	T	W	T	F	S		S	M	T	W	T	F	S	
JANUARY					1	2	3					1	2 <sup>F</sup>	3	4	JULY
	4	5 <sup>F</sup>	6	7	8	9	10		5	6	7	8	9	10	11	
	11	12	13	14	15 <sup>+</sup>	16 <sup>+</sup>	17 <sup>+</sup>		12	13	14	15 <sup>*</sup>	16 <sup>N</sup>	17 <sup>+</sup>	18	
	18 <sup>+</sup>	19 <sup>*</sup>	20 <sup>N</sup>	21 <sup>*</sup>	22 <sup>+</sup>	23 <sup>+</sup>	24 <sup>+</sup>		19	20	21	22	23	24	25	
FEBRUARY	25 <sup>+</sup>	26 <sup>+</sup>	27 <sup>+</sup>	28 <sup>+</sup>	29 <sup>+</sup>	30 <sup>+</sup>	31 <sup>+</sup>		26	27	28	29	30	31 <sup>F</sup>	1	
	1 <sup>+</sup>	2 <sup>+</sup>	3 <sup>F</sup>	4 <sup>+</sup>	5 <sup>+</sup>	6 <sup>+</sup>	7 <sup>+</sup>		2	3	4	5	6	7	8	AUGUST
	8 <sup>+</sup>	9 <sup>+</sup>	10 <sup>+</sup>	11 <sup>+</sup>	12 <sup>+</sup>	13 <sup>+</sup>	14 <sup>+</sup>		9	10	11	12 <sup>*</sup>	13 <sup>*</sup>	14 <sup>N</sup>	15	
	15 <sup>+</sup>	16 <sup>+</sup>	17 <sup>*</sup>	18 <sup>N</sup>	19 <sup>*</sup>	20	21		16	17	18	19	20	21	22	
	22	23	24	25	26	27	28		23	24	25	26	27	28	29 <sup>F</sup>	
MARCH	1	2	3	4	5 <sup>F</sup>	6	7		30	31	1	2	3	4	5	SEPTEMBER
	8	9	10	11	12	13 <sup>+</sup>	14 <sup>+</sup>		6	7	8	9	10	11	12	
	15 <sup>+</sup>	16 <sup>+</sup>	17 <sup>+</sup>	18 <sup>*</sup>	19 <sup>*</sup>	20 <sup>N</sup>	21 <sup>+</sup>		13 <sup>+</sup>	14 <sup>*</sup>	15 <sup>*</sup>	16 <sup>*</sup>	17	18	19	
	22 <sup>+</sup>	23 <sup>+</sup>	24 <sup>+</sup>	25 <sup>+</sup>	26 <sup>+</sup>	27 <sup>+</sup>	28 <sup>+</sup>		20	21	22	23	24	25	26	
	29	30	31	1	2	3	4 <sup>F</sup>		27	28 <sup>F</sup>	29	30	1	2	3	
APRIL	5	6	7	8	9	10	11		4	5	6	7	8	9	10	OCTOBER
	12	13	14	15 <sup>*</sup>	16 <sup>*</sup>	17 <sup>*</sup>	18 <sup>N</sup>		11	12 <sup>*</sup>	13 <sup>N</sup>	14 <sup>*</sup>	15	16	17	
	19	20	21	22	23	24	25		18	19	20	21	22	23	24	
	26	27	28	29	30	1	2		25	26	27 <sup>F</sup>	28	29	30	31	
MAY	3	4 <sup>F</sup>	5	6	7	8	9		1	2	3	4	5	6	7	NOVEMBER
	10	11	12	13	14	15	16		8	9	10 <sup>*</sup>	11 <sup>N</sup>	12 <sup>*</sup>	13	14	
	17	18 <sup>N</sup>	19 <sup>*</sup>	20 <sup>*</sup>	21	22	23		15	16	17	18	19	20	21	
	24	25	26	27	28	29	30		22	23	24	25 <sup>F</sup>	26	27	28	
	31	1	2 <sup>F</sup>	3	4	5	6		29	30	1	2	3	4	5	
JUNE	7	8	9	10	11	12	13		6	7	8	9 <sup>+</sup>	10 <sup>+</sup>	11 <sup>N</sup>	12 <sup>+</sup>	DECEMBER
	14	15 <sup>*</sup>	16 <sup>N</sup>	17 <sup>*</sup>	18	19	20		13 <sup>+</sup>	14	15	16	17	18	19	
	21	22	23	24	25	26	27		20	21	22	23	24	25 <sup>F</sup>	26	
	28	29	30						27	28	29	30	31	1	2	
	S	M	T	W	T	F	S		3	4	5	6	7	8	9	2016
									10 <sup>N</sup>	11 <sup>*</sup>	12 <sup>*</sup>	13 <sup>*</sup>	14	15	16	JANUARY
									17	18	19	20	21	22	23	
									24 <sup>F</sup>	25	26	27	28	29	30	
									31							
									S	M	T	W	T	F	S	

20 Regular World Day (RWD)

21 Priority Regular World Day (PRWD)

18 Quarterly World Day (QWD)  
also a PRWD and RWD

7 Regular Geophysical Day (RGD)

9 10 World Geophysical Interval (WGI)

+ Incoherent Scatter Coordinated Observation Day  
(The period Jan 15-Feb 15 is a StratWarm Alert interval with a fallback interval of Feb 10-15. In case of conflicting modes the Solar Eclipse campaign has priority over the Meridional Circle campaign. The period March 13-27 is a Meridional Circle Alert interval based on predictions of magnetic disturbances. Five days notice should be given for both the StratWarm and Meridional Circle Alerts.)

20 Days of Solar Eclipse: March 20, total; Sept 13, partial

30 31 Airglow and Aurora Period

29\* Dark Moon Geophysical Day (DMGD)

## NOTES on other dates and programs of interest:

1. Days with significant meteor shower activity (based on UT in year 2015) — regular meteor showers: Dec 28-Jan 12; Apr 16-25; Apr 19-May 28; May 14-Jun 24; May 20-Jul 05; Jun 05-Jul 17; Jul 12-Aug 23; Jul 17-Aug 24; Sep 09-Oct 09; Oct 02-Nov 07; Nov 06-Nov 30; Dec 04-Dec 17; Dec 17-26. These can be studied for their own geophysical effects or may be “geophysical noise” to other experiments.  
(<http://www.imo.net/calendar>)
2. **GAW (Global Atmosphere Watch)** - early warning system for changes in greenhouse gases, ozone layer, and long range transport of pollutants.  
[http://www.wmo.int/pages/prog/arep/gaw/gaw\\_home\\_en.html](http://www.wmo.int/pages/prog/arep/gaw/gaw_home_en.html)
3. **VarSITI (Variability of the Sun and Its Terrestrial Impact)** – SCOSTEP Program 2014-2018. Four scientific elements: SEE (Solar evolution and Extrema), MiniMax24/ISEST (International Study of Earth-affecting Solar Transients), SPeCIMEN (Specification and Prediction of the Coupled Inner-Magnetospheric Environment), and ROSMIC (Role Of the Sun and the Middle atmosphere/thermosphere/ionosphere In Climate).  
Contact: Prof. Marianna Shepherd ([mshepher@yorku.ca](mailto:mshepher@yorku.ca))  
[http://www.yorku.ca/scostep/?page\\_id=1426](http://www.yorku.ca/scostep/?page_id=1426)
4. **ILWS (International Living With a Star) Program** – International effort to stimulate, strengthen, and coordinate space research to understand the governing processes of the connected Sun-Earth System as an integrated entity.  
<http://ilwsonline.org/>
5. **ISWI (International Space Weather Initiative)** – Program of international cooperation to advance space weather science by a combination of instrument deployment, analysis, and interpretation of space weather data from the deployed instruments in conjunction with space data, and communicate the results to the public and students. The goal of the ISWI is to develop the scientific insight necessary to understand the science, and to reconstruct and forecast near-Earth space weather. This includes instrumentation, data analysis, modelling, education, training, and public outreach.  
Contact: Dr. J. Davila ([Joseph.M.Davila@nasa.gov](mailto:Joseph.M.Davila@nasa.gov))  
<http://www.iswi-secretariat.org/>
6. **+ Incoherent Scatter Coordinated Observations Days** - starting no later than 1300 UT on the first day of the interval and ending no earlier than 2000 UT on the last day of the interval (minimum 31 hours of observations): January 15 - February 15 alert for StratWarm and Gravity Wave; March 20-22 Solar Eclipse; March 13-27 alert for MERINO; July 15-17 Synoptic; December 09-13 Northern.  
<http://www.isr.sri.com/wd2015.html>

<b>StratWarm</b>	Sudden stratospheric warming (StratWarm): Dynamics, electrodynamics, temperature and electron density in the lower and upper thermosphere and ionosphere during sudden stratospheric warming (L. P. Goncharenko, <a href="mailto:lpg@haystack.mit.edu">lpg@haystack.mit.edu</a> )
<b>Gravity Wave</b>	Gravity wave coupling with winds and tides: Wave propagation into the thermosphere and potential coupling with winds and tides (A. Kavanagh, <a href="mailto:andkav@bas.ac.uk">andkav@bas.ac.uk</a> )
<b>Solar Eclipse</b>	Solar Eclipse: Ionospheric response to the March 20 total solar eclipse (O. Roberts, <a href="mailto:owr6@aber.ac.uk">owr6@aber.ac.uk</a> ; I. Häggström, <a href="mailto:ingemar@eiscat.se">ingemar@eiscat.se</a> )
<b>MERINO</b>	Meridional Circle (MERINO): Latitudinal variations and their east-west hemispheric differences during solar storms and/or under quiet magnetic conditions (S. Zhang, <a href="mailto:shunrong@haystack.mit.edu">shunrong@haystack.mit.edu</a> )
<b>Synoptic</b>	Synoptic: Emphasize wide coverage of the F region with some augmented coverage of the topside or E region to fill in areas of the databases that have relatively little data (J. Sojka, <a href="mailto:sojka@usu.edu">sojka@usu.edu</a> ; I. McCrea, <a href="mailto:ian.mccrea@stfc.ac.uk">ian.mccrea@stfc.ac.uk</a> )
<b>Northern</b>	Northern Deep Polar Winter Observations: Because of the optical conditions near solstice, this is a unique opportunity to capitalize on northern high-latitude measurements by optical instruments (H. Carlson, <a href="mailto:herbert.c.carlson@gmail.com">herbert.c.carlson@gmail.com</a> ; Y. Dabakk, <a href="mailto:y.r.dabakk@fys.uio.no">y.r.dabakk@fys.uio.no</a> ; H. Dahlgren, <a href="mailto:hannad@kth.se">hannad@kth.se</a> ; K. Oksavik, <a href="mailto:kjellmar.oksavik@uib.no">kjellmar.oksavik@uib.no</a> ; J. Semeter, <a href="mailto:jls@bu.edu">jls@bu.edu</a> ; A. Wood, <a href="mailto:alan.wood@ntu.ac.uk">alan.wood@ntu.ac.uk</a> ).

## EXPLANATIONS

This Calendar continues the series begun for the IGY years 1957-58, and is issued annually to recommend dates for solar and geophysical observations which cannot be carried out continuously. Thus, the amount of observational data in existence tends to be larger on Calendar days. The recommendations on data reduction and especially the flow of data to **ICSU World Data System (WDS)** in many instances emphasize Calendar days. The Calendar is prepared by the **International Space Environment Service (ISES)** with the advice of spokesmen for the various scientific disciplines.

The **Solar Eclipses** are:

**a.) 20 Mar 2015, total solar eclipse.** Starts over the northern Atlantic Ocean and proceeds north, passing the Faroe Islands (eastern edge of totality, eclipse centered at 9:42 UTC), and the Svalbard Archipelago (western edge, centered at 10:12 UTC at the Spitsbergen island). Iceland will be to the west of the path, with 97% coverage at Reykjavik. Partial phases visible throughout Europe and from the western half of Asia and northwestern Africa. London will have an 87% eclipse, Paris an 80% eclipse centered at 9:30 UTC, and Moscow a 65% eclipse centered at 10:20 UTC. In Africa and extending eastward, the southern limit of the partial eclipse will extend from Guinea, through Burkina Faso, southern Nigeria, northern Chad, the midst of Egypt, northern Saudi Arabia, mid-Iraq, northern Iran, southern Turkmenistan, southern Uzbekistan, southern Kyrgyzstan, extreme northwestern China, and western Mongolia. On the western limit, the eclipse will be barely visible in easternmost Newfoundland and Labrador and on St. Pierre et Miquelon.

**b.) 13 Sep 2015, partial solar eclipse.** Up to 78% coverage from the side of Antarctica facing northward toward Africa and Asia over to Australia. Cape Town, South Africa, will see 42% coverage at 5:43 UTC. Gabarone, Botswana will have 23% coverage; Windhoek, Namibia, 19% coverage; Harare, Zimbabwe 7% coverage; Lusaka, Zambia, only 2% coverage; and minimal coverage in southernmost Malawi, Mozambique, and Madagascar. The northern limit passes through Reunion Island; Mauritius is north of the limit. The French Southern & Antarctic Lands as well as Heard Island & McDonald Islands will have ~40% coverage. Marion Island and Prince Edward Island have about ~56% coverage°.

Information assembled by Jay M. Pasachoff, Williams College (Williamstown, MA), Chair, International Astronomical Union's WG on Eclipses (<http://www.eclipses.info>) with thanks to Fred Espenak (Arizona) (*Thousand Year Canon of Solar Eclipses 1501 to 2500*; <http://www.astropixels.com/pubs/>; <http://www.EclipseWise.com>) and Xavier Jubier (Paris) for their data and maps.

**Meteor Showers** Dates selected from the International Meteor Organization Shower Calendar 2015. Peak times provided by A. McBeath. Includes meteor showers observable mainly by radio and radar techniques. The dates are given in Note 1 on the previous page.

**Definitions:**

Time	= Universal Time (UT)
Geophysical Day (RGD)	= each Wednesday
Regular World Day (RWD)	= Tuesday, Wednesday and Thursday near middle of month
Priority Regular World Day (PRWD)	= the Wednesday RWD
World Geophysical Interval (WGI)	= 14 consecutive days each season
Quarterly World Day (QWD)	= PRWD in the WGI
ALERT	= occurrence of unusual solar or geophysical conditions, broadcast once daily soon after 0400 UT
STRATWARM	= stratospheric warmings

For more detailed explanations of the definitions, please visit [ftp://ftp.ngdc.noaa.gov/STP/publications/igc\\_calendars/](ftp://ftp.ngdc.noaa.gov/STP/publications/igc_calendars/) or <http://www.ises-spaceweather.org/>.

**Priority recommended programs for measurements not made continuously** (in addition to unusual ALERT periods):

**Airglow and Aurora** — Observation periods are New Moon periods, especially the 7 day intervals on the calendar;

**Atmospheric Electricity** — Observation periods are the RGD each Wednesday, beginning on 7 Jan 2014 at 0000 UT, 14 Jan at 0600 UT, 21 Jan at 1200 UT, 28 Jan at 1800 UT, etc. Minimum program is PRWDs.

**Geomagnetic Phenomena** — At the minimum, need observation periods and data reduction on RWDs and during MAGSTORM Alerts.

**Ionospheric Phenomena** — Quarter-hourly ionograms; more frequently on RWDs, particularly at high latitude sites; f-plots on RWDs; hourly ionogram scaled parameters to WDCs on QWDs; continuous observations for solar eclipse in eclipse zone. See **Airglow and Aurora**.

**Incoherent Scatter** — Observations on Incoherent Scatter Coordinated Days; also intensive series on WGI or Airglow and Aurora periods.

**Special programs:** Ian McCrea, Rutherford Appleton Laboratory, UK; Tel:+44(0)1235 44 6513; Fax:+44(0)1235 44 5848; email: [ian.mccrea@stfc.ac.uk](mailto:ian.mccrea@stfc.ac.uk), chair of URSI ISWG (Commission G). See <http://www.isr.sri.com/wd2015.html>

**Ionospheric Drifts** — During weeks with RWDs.

**Travelling Ionospheric Disturbances (TIDs)** — special periods, probably PRWDs or RWDs.

**Ionospheric Absorption** — Half-hourly on RWDs; continuous on solar eclipse days in eclipse zone and conjugate area. Daily measurements during Absorption Winter Anomaly at temperate latitude stations (Oct-Mar Northern Hemisphere; Apr-Sep Southern Hemisphere).

**Backscatter and Forward Scatter** — RWDs at least.

**Mesospheric D region electron densities** — RGDs around noon.

**ELF Noise Measurements of earth-ionosphere cavity resonances** — WGI.

**All Programs** — Appropriate intensive observations during unusual meteor activity.

**Meteorology** — Especially on RGDs. On WGI and STRATWARM Alert Intervals, please monitor on Mondays, Wednesdays, and Fridays.

**GAW (Global Atmosphere Watch)** -- WMO program to integrate monitoring of atmospheric composition. Early warning system of changes in atmospheric concentrations of greenhouse gases, ozone, and pollutants (acid rain and dust particles). WMO, 7 bis avenue de la Paix, P.O. Box 2300, CH-1211 Geneva 2, Switzerland. [http://www.wmo.int/pages/prog/arep/gaw/gaw\\_home\\_en.html](http://www.wmo.int/pages/prog/arep/gaw/gaw_home_en.html)

**Solar Phenomena** — Solar eclipse days, RWDs, and during PROTON/FLARE ALERTS.

**VarSITI (Variability of the Sun and Its Terrestrial Impact) –SCOSTEP** Program 2014-2018. VarSITI strives for international collaboration in data analysis, modeling, and theory to understand how the solar variability affects Earth. VarSITI will have four scientific elements that address solar terrestrial problems keeping the current low solar activity as the common thread: SEE (Solar evolution and Extrema), MiniMax24/ISEST (International Study of Earth-affecting Solar Transients), SPeCIMEN (Specification and Prediction of the Coupled Inner-Magnetospheric Environment), and ROSMIC (Role Of the Sun and the Middle atmosphere/thermosphere/ionosphere In Climate). Contact is Prof. Marianna Shepherd ([mshepherd@yorku.ca](mailto:mshepherd@yorku.ca)), President of SCOSTEP. Co-chairs are Katya Georgieva (SRTI, Bulgaria) and Kazuo Shiokawa (STEL, Japan). [http://www.yorku.ca/scostep/?page\\_id=1426](http://www.yorku.ca/scostep/?page_id=1426)

**ILWS (International Living With a Star)** – International effort to stimulate, strengthen, and coordinate space research to understand the governing processes of the connected Sun-Earth System as an integrated entity. Contact [info@ilwsonline.org](mailto:info@ilwsonline.org). See <http://ilwsonline.org/>.

**ISWI (International Space Weather Initiative)** – Program of international cooperation to advance space weather science. The goal of the ISWI is to develop the scientific insight necessary to understand the science, and to reconstruct and forecast near-Earth space weather. Contact: Dr. J. Davila - [Joseph.M.Davila@nasa.gov](mailto:Joseph.M.Davila@nasa.gov). See <http://www.iswi-secretariat.org/>.

**Space Research, Interplanetary Phenomena, Cosmic Rays, Aeronomy** — QWDs, RWDs, Airglow and Aurora periods.

The International Space Environment Services (ISES) is a space weather service organization currently comprised of 16 Regional Warning Centers around the globe, 4 Associate Warning Centers, and one Collaborative Expert Center (European Space Agency). ISES is a Network Member of the International Council for Science World Data System (ICSU-WDS) and collaborates with the World Meteorological Organization (WMO) and other international organizations, including the Committee on Space Research (COSPAR), the International Union of Radio Science (URSI), and the International Union of Geodesy and Geophysics (IUGG). The mission of ISES is to improve, to coordinate, and to deliver operational space weather services. ISES is organized and operated for the benefit of the international space weather user community.

ISES members share data and forecasts among the Regional Warning Centers (RWCs) and provide space weather services to users in their regions. The RWCs provide a broad range of services, including: forecasts, warnings, and alerts of solar, magnetospheric, and ionospheric conditions; extensive space environment data; customer-focused event analyses; and long-range predictions of the solar cycle. While each RWC concentrates on its own region, ISES serves as a forum to share data, to exchange and compare forecasts, to discuss user needs, and to identify the highest priorities for improving services.

ISES works in close cooperation with the World Meteorological Organization, recognizing the mutual interest in global data acquisition and information exchange, in common application sectors, and in understanding and predicting the coupled Earth-Sun environment.

This Calendar for 2015 has been drawn up by Dr. R. A. D. Fiori of the ISES Steering Committee, in association with spokesmen for the various scientific disciplines in the Scientific Committee on Solar-Terrestrial Physics (SCOSTEP), the International Association of Geomagnetism and Aeronomy (IAGA), URSI and other ICSU organizations. Similar Calendars are issued annually beginning with the IGY, 1957-58. PDF versions of the past calendars are available online.

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**Copies of earlier years' calendars are available upon request to either ISES Director, Dr. Terry Onsager, NOAA Space Weather Prediction Center, 325 Broadway, Boulder, CO, 80305, USA, telephone +1-303-497-5713, FAX +1-303-497-3645, e-mail [Terry.Onsager@noaa.gov](mailto:Terry.Onsager@noaa.gov), or contact ISES Secretary for World Days, Dr. Robyn Fiori, telephone +1-613-837-5137, e-mail [Robyn.Fiori@NRCan-RNCan.gc.ca](mailto:Robyn.Fiori@NRCan-RNCan.gc.ca). Beginning with the 2008 Calendar, all calendars are available only in digital format.**

The website for the International Geophysical Calendar, including recent versions, can be found at <http://www.ises-spaceweather.org/>. Archived calendars from 1957 to present are available at [ftp://ftp.ngdc.noaa.gov/STP/publications/igc\\_calendars/](ftp://ftp.ngdc.noaa.gov/STP/publications/igc_calendars/).